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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/787,381	02/26/2004	Florian O. Mertens	GP-304820	4785
60770 7590 11/12/2009 General Motors Corporation c/o REISING, ETHINGTON, BARNES, KISSELLE, P.C. P.O. BOX 4390 TROY, MI 48099-4390				
EXAMINER WARTALOWICZ, PAUL A				
ART UNIT 1793		PAPER NUMBER		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/787,381

Applicant(s)

MERTENS ET AL.

Examiner

PAUL A. WARTALOWICZ

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 August 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) 6 and 71 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 3-5, 7, 8, 10-12, 14, 15, 19-21, 26-29, 48, 49, 54, 55, 57, 61, 63-70, 72-76, 80-82, 84 and 88 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-846)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Continuation of Disposition of Claims: Claims pending in the application are 1,3-8,10-12,14,15,19-21,26-29,48,49,54,55,57,61,63-76,80-82,84 and 88.

DETAILED ACTION

Withdrawn Rejections

The rejections under 35 USC 112, 1st paragraph and the claim objections have been withdrawn.

Election/Restrictions

Upon further consideration, it appears that claims 6 and 71 are drawn to species not elected (those species including a sodium cation). Additionally, it is not clear from the specification which lithium species would lead to endothermic reactions. If it can be shown that reactions between hydrides and hydroxides containing lithium, for which applicant has support for, are endothermic the restriction requirement for claims 6 and 71 will be withdrawn.

Response to Arguments

Applicant's arguments filed 8/7/09 have been fully considered but they are not persuasive.

Applicant argues that the Examiner's list of lithium-containing species overlooks lithium aluminum hydroxide and that the specification is does not state that the reaction of a lithium hydride with a lithium aluminum hydrated hydroxide or lithium aluminum is exothermic or endothermic.

However, it appears that the specification is unclear whether any reactions between hydrides and hydroxides containing lithium cations, for which applicant have support for, are endothermic.

Additionally, applicant argues that the claims are not limited to identified lithium species and others may lead to endothermic reactions and the hydride and hydroxide reactants may comprise additional species with other cations. However, it is not clear from the specification which lithium species would lead to endothermic reactions. Additionally, as set forth in the restriction, the species currently elected are drawn to both the hydride and hydroxide comprising lithium. It appears that claims 6 and 71 are drawn to reactants not elected. Therefore, these claims are withdrawn.

Applicant argues that neither the Machin nor Amendola **start with** a mixture of hydride particles and hydroxide particles that **is formulated to substantially react fully** to produce hydrogen and an oxide (emphasis added).

However, it appears the claims recite "a mixture of a second portion of particles of said hydride and particles of a hydroxide in a second reaction." It is unclear what "starting with" a mixture of hydride and hydroxide particles is meant to encompass. It appears that the claims require two reactions: a first reaction between a first portion of hydride particle and water (that can be present as a hydrated hydroxide) and a second reaction between a second portion of hydride particles and hydroxide particles (that can be in the form of hydrated hydroxide particles). Machin appears to teach the first reaction (page 2217, reaction 24) and the second reaction (page 2216, reaction 22). It is unclear how these reactions and other teachings of Machin do not meet the limitations of claim 1.

Does applicant intend to claim that hydride and hydroxide are *initially* mixed together? The claims do not require this. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., hydride and hydroxide are *initially* mixed together) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). It appears that initially water is mixed with LiH (page 2207). However, as this reaction progresses, lithium hydroxide hydride is formed such that a reaction between LiH and lithium hydroxide hydrate takes place in the presence of a large dose of water to produce hydroxide and hydrogen (page 2207, 2217). The hydroxide can then react with remaining hydride to produce lithium oxide and more hydrogen (page 2207, 2216, reaction 22). Additionally, it appears that some dependent claims require this feature (claims 2, 3, *inter alia*).

Regarding the hydride particles and hydroxide particles formulated to substantially react fully, it appears that Machin is concerned with providing an initial mixture of LiH and water in such proportions to react lithium hydride substantially completely with water and hydroxide as evinced by the disclosure at page 2207-8. Specifically, Machin states that the nature of the product depended solely on the amount of water vapor (page 2208). Additionally, one of ordinary skill in the art would recognize that the amount of hydride and water needed to completely react the hydride

with water and hydroxide is clearly delineated by reactions (i), (ii), (24), (22), inter alia (pp 2208, 2216, 2217).

Additionally, Machin does not expressly disclose that heat is formed in reactions (i), (ii), or (24).

However, it appears that at least some of the reactions, *supra*, would produce heat as the reactions are substantially similar to the equations because reactions (i), (ii), and (24) represent reactions between LiH and water (either in free water or hydrated hydroxide form). As the reactions, discussed *supra*, are all carried out in the same reaction vessel (page 2207), the heat formed in the reaction between LiH and water would be transferred to the reaction of hydride and hydroxide.

Applicant argues that reactions are carried out at 400 C and not practical in vehicle hydrogen storage systems.

However, the temperature of the reactions is not claimed. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., temperature of the reactions) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues that Machin does not teach or suggest providing sufficient quantity of hydride particles in the mixture to react with water and to react with other hydroxides to release all available hydrogen.

However, it appears that Machin is concerned with providing an initial mixture of LiH and water in such proportions to react lithium hydride substantially completely with water and hydroxide as evinced by the disclosure at page 2207-8. Specifically, Machin states that the nature of the product depended solely on the amount of water vapor (page 2208). Additionally, one of ordinary skill in the art would recognize that the amount of hydride and water needed to completely react the hydride with water and hydroxide is clearly delineated by reactions (i), (ii), (24), (22), inter alia (pp 2208, 2216, 2217).

Additionally, applicant argues that Machin mentions a reaction on page 2217 but the reaction does not give an oxide as product, as required by the claims.

However, it appears that lithium oxide is formed by other reactions occurring in the reactor (page 2216, reaction 22; page 2208, reaction I, page 2207).

Applicant argues that Machin does not disclose any of the features of any of applicants remaining claims.

However, this argument does not specifically point out which claims or features that Machin does not teach, regarding remaining claims. In the absence of such specificity, the rejection is maintained for the reasons set forth on the record.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 3-5, 7, 8, 10-12, 14, 15, 19-21, 26-29, 54-55, 57, 63, 67-70, 72-76, 80-82, 84 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Machin et al. ("Kinetics of the Reaction of Water Vapour with Crystalline Lithium Hydride").

Machin et al. teach a method for producing hydrogen (page 2205) wherein lithium hydroxide hydrate is reacted with lithium hydride in particle form (page 2206) in the presence of water to produce hydrogen (page 2217).

It appears that Machin et al. teach water, lithium hydroxide, and lithium hydride are present in quantities such that the reaction of the reactions would be inherently taught including production of heat by the reaction of lithium hydride and water.

If these reactions are not inherently taught, it would be obvious to one of ordinary skill in the art at the time applicant's invention was made to provide mixing water, lithium hydroxide, and lithium hydride in amounts sufficient to produce hydrogen.

Additionally, it appears that Machin et al. teach that LiH reacts with both LiOH and LiOH H₂O (page 2216, 2217) such that claims 20, 21, 57, 74-76, 84 are taught by Machin.

Additionally, it appears that the embodiment disclosed in paragraphs 0105-0110 (it appears that applicant is referencing the PG Pub, as the specification filed does not have that many paragraphs) only requires water and hydride present initially and that the reaction between water and hydride produce heat **and** the hydroxide to be reacted with the remaining hydride. See paragraphs 0109 and 0110.

Regarding the hydride particles and hydroxide particles formulated to substantially react fully, it appears that Machin is concerned with providing an initial mixture of LiH and water in such proportions to react lithium hydride substantially completely with water and hydroxide as evinced by the disclosure at page 2207-8. Specifically, Machin states that the nature of the product depended solely on the amount of water vapor (page 2208). Additionally, one of ordinary skill in the art would recognize that the amount of hydride and water needed to completely react the hydride

with water and hydroxide is clearly delineated by reactions (i), (ii), (24), (22), inter alia (pp 2208, 2216, 2217).

Claims 48, 49, 61, 64-66, and 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Machin et al. ("Kinetics of the Reaction of Water Vapour with Crystalline Lithium Hydride") in view of Amendola et al. (U.S. 2004/0033194).

Machin teaches a process as taught above in claim 1.

Machin fails to teach lithium borohydride as the hydride used in the hydrogen generating process.

Amendola et al., however, teach a method for hydrogen generation [0024] comprising lithium borohydride [0030] for the purpose of providing useful hydrogen generation systems [0026].

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide lithium borohydride [0030] in Machin in order to provide useful hydrogen generation systems [0026] as taught by Amendola et al.

Regarding claims 65, 65, and 88, it appears that Machin et al. teach that LiH reacts with both LiOH and LiOH·H₂O.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PAUL A. WARTALOWICZ whose telephone number is (571)272-5957. The examiner can normally be reached on 8:30-6 M-Th and 8:30-5 on Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Paul Wartalowicz
November 8, 2009

/Stanley Silverman/
Supervisory Patent Examiner, AU 1793